

6-19-00 A

06/16/00
JC833 U.S. PTO

8X8S.249PA
June 16, 2000

JC625 U.S. PTO
09/597704
06/16/00

COMMUNICATIONS CONTROLLER AND METHOD THEREFOR

Related Patent Documents

This patent document is related to U.S. Patent Application Serial No.

5 09/005,053, entitled "Videocommunicating Apparatus and Method Therfor", filed on January 1, 1998, which is a continuation-in-part of U.S. Patent Application Serial No. 08/908,826, filed on August 8, 1997 (now U.S. Patent 5,790,712), which is a continuation of U.S. Patent Application Serial No. 08/658,917, filed on May 31, 1996 (now abandoned), which is a continuation of U.S. Patent Application Serial No.

10 10 07/303,973, filed September 9, 1994 (now abandoned), which is a continuation of U.S. Patent Application Serial No. 07/838,382, filed on February 19, 1992, (now U.S. Patent No. 5,379,351). This patent document is further related to U.S. Patent Application Serial No. _____ (8X8S.246PA), entitled "Communications System Architecture" and filed on June 16, 2000; to U.S. Patent Application Serial No. _____

15 15 _____ (8X8S.247PA), entitled "Communications Service Provider Network" and filed on June 16, 2000; to U.S. Patent Application Serial No. _____ (8X8S.248PA), entitled "IP Phone Circuit Arrangement and Method" and filed on June 16, 2000; to U.S. Patent Application Serial No. _____ (8X8S.254PA), entitled "High Availability IP Telephony" and filed on June 16, 2000; to U.S. Patent

20 20 Application Serial No. _____ (8X8S.255PA), entitled "System Interface Implementation for Hosted iPBX" and filed on June 16, 2000; to U.S. Patent Application Serial No. _____ (8X8S.256PA), entitled "IP Telephony Station Equipment" and filed on June 16, 2000; and to U.S. Patent Application Serial No.

8X8S.249PA
June 16, 2000

_____ (8X8S.257PA), entitled "iPBX Hosting" and filed on June 16, 2000.

All of the above-mentioned documents, as well as the documents appended hereto, are fully incorporated herein by reference.

Field of the Invention

5 The present invention relates to communication systems, and more particularly, to a communications controller and control methodology.

Background of the Invention

The electronics industry continues to rely upon advances in technology to
10 realize higher-functioning devices at cost-effective prices. For many communication applications, realizing higher-functioning devices in a cost-effective manner requires the creative use of communications channels. Many technologies have been developed that have enhanced communications. Examples include the Internet, facsimile applications, public switched telephone networks (PSTN), wireless telephones,
15 voicemail systems, email systems, paging systems, conferencing systems, electronic calendars and appointment books, electronic address books, and video-image processing systems that communicate video data simultaneously with voice data over a telephones and the Internet. As the popularity of these technologies increases, so does the need to merge and coordinate these technologies in a manner that is convenient and
20 cost-effective for the user.

The above-mentioned technologies have been developed in a relatively isolated manner. Large-scale integration of multiple communications systems has been costly and difficult to achieve and manage. One difficulty stems from the variety of communications channels and data types used for various applications. For example,

5 telephony signals can now be transmitted by methods and systems including traditional publicly-switched telephone networks (PSTN), Internet telephony service providers (ITSP), packet-based systems, digital wireless systems, analog wireless systems, private branch exchanges (PBX), cable systems, T1 systems, integrated service digital network (ISDN), and digital subscriber line (DSL) systems, to name a few. Many telephone

10 systems, particularly for business applications, offer services including voicemail, facsimile, call forwarding, and other call-controls, but these systems are often costly, difficult to manage, limited in scope, and do not offer integration of various communications methods. In addition to difficulties inherent in coordinating telephony-type communications, the coordination of additional communications, such as text,

15 video, or other data, provides additional challenges.

Widespread acceptance and usage of communication systems and services are largely a function of cost and user convenience. Therefore, widespread acceptance and usage of such technology cannot be forced, even when appropriately addressing the marketing needs and overcoming the exorbitant costs of the mass production

20 equipment.

The scalability of a communications system weighs heavily upon the acceptance of the system. As the face of today's workplace is changing, the ability to provide flexible communications services is becoming increasingly important. Many employees

are highly mobile, moving between companies and between jobs within a company.

When employees are added, leave or move, the communications systems for those employees must be modified. In addition, many employees work from several locations, such as a base office, home, or a branch office. To accommodate ongoing

5 communications needs a user-friendly and user-reconfigurable system would be
advantageous.

As technology advances, traditional distinctions between communications types, such as video, audio, email, and others are breaking down. Wireless telephones and modems are being adapted for Internet use, and Internet telephony communication

10 applications are becoming more viable and even commonplace. For both unsophisticated and sophisticated users of such communication systems and services, the coordination of various communications methods and systems would be beneficial. In addition, it is important to provide scalable, cost-effective, user-friendly control over the communications networks and over the devices that interface with and configure the
15 networks.

Summary of the Invention

The present invention is directed to a communications arrangement adapted to control and coordinate various types of communications data in a manner that makes
20 possible the break-down of traditional barriers preventing the integration of communications data types. In addition, the ease of use and cost-effectiveness of the present invention enable the use of such communications control and coordination in small to medium-sized business applications. The arrangement can be used from

anywhere on an IP communications link, and is adaptable for use with any OOP-based interface. The present invention is exemplified in a number of implementations and applications, some of which are summarized below.

According to an example embodiment of the present invention, a user-programmable communications arrangement having a computer including a display is adapted to control an IP telephony system. The arrangement comprises a user interface and a programmable controller that are adapted to control an IP telephony system. The controller provides user-selected IP telephony configuration information to a control center communicatively coupled to a plurality of IP telephony devices. The user interface is adapted to display configuration information for one or more of the following: user control of an IP telephony device, office telephone administration control of a plurality of telephony devices, and system administrator control of telephony system configuration. The IP telephony configuration information is selected to control communications between, and to programmably configure, the control center and the plurality of IP telephony devices.

In another example embodiment of the present invention, a user-programmable communications system is adapted to control a communications network using OOP code. A plurality of telephony devices are coupled to an IP communications link and adapted to communicate IP telephony data. A computer station having an OOP interface is adapted to display communications information including telephony communications information and to provide communications control selections including telephony control selections to the IP communications link. The control selections are received at a programmable communications server having an IP

telephony switch and an OOP interface coupled to the IP communications link. The server is adapted to control the communications network, including the plurality of telephony devices, in response to the selections received through the OOP interface.

The above summary of the present invention is not intended to describe each 5 illustrated embodiment or every implementation of the present invention. The figures and detailed description that follow more particularly exemplify these embodiments.

Brief Description of the Drawings

The invention may be more completely understood in consideration of the 10 following detailed description of various embodiments of the invention in connection with the accompanying drawings, in which:

FIG. 1 is a user programmable communications controller coupled to an IP communications link, according to an example embodiment of the present invention;

FIG. 2 is a user-interface display, according to another example embodiment of 15 the present invention;

FIG. 3 is another user-interface display, according to another example embodiment of the present invention; and

FIG. 4 is a user-programmable communications control system, according to another example embodiment of the present invention.

20 While the invention is amenable to various modifications and alternative forms, specifics thereof have been shown by way of example in the drawings and will be described in detail. It should be understood, however, that the intention is not to limit the invention to the particular embodiments described. On the contrary, the intention is

to cover all modifications, equivalents, and alternatives falling within the spirit and scope of the invention as defined by the appended claims.

Detailed Description

5 The present invention is believed to be applicable to various types of communications systems, and has been found to be particularly suited to systems requiring or benefiting from a user-friendly controller for managing various telephony communications data types via an Internet protocol (IP) network. While the present invention is not necessarily limited to such systems, various aspects of the invention
10 may be appreciated through a discussion of various examples using this context.

According to an example embodiment of the present invention, a user-programmable communications network control arrangement is adapted to control the processing of communications data of various types using a cost-effective, user-friendly operations controller and control platform. The control arrangement includes a
15 programmable computer station having an OOP interface and adapted to display communications information including telephony communications information. The displayed information includes control selections for the communications network, including selections for controlling the processing of telephony data. The selections are made at the computer station and passed to an IP communications link.

20 A programmable communications server having an IP telephony switch and an OOP interface coupled to the IP communications link receives the control selections. The server is further communicatively coupled to a plurality of telephony devices adapted to receive and process IP telephony data, and may be include a connection to a

PSTN through a gateway. The server uses the control selections to control communications in the communications network, such as between the plurality of telephony devices, or between a telephone coupled to the PSTN and one or more of the plurality of telephony devices. In this manner, a communications network having a

5 variety of communications devices can be controlled using a portable and non-hardware-dependent OOP-based controller. For information regarding an example communications network to which the present invention may apply, reference may be made to U.S. Patent Application Serial No. _____, entitled

“Communications Service Provider Network,” filed concurrently herewith and fully

10 incorporated herein by reference.

The OOP controller is configurable for use in various applications including system administration, office administration, personal communications management, and service provider administration of subscribers. For more information regarding example applications to which the present invention applies, reference may be made to

15 “8x8 Intraswitch Synthesis of Form,” append hereto and fully incorporated herein by reference. In one example embodiment of the present invention, a series of OOP controllers is used in a user facility having telephony service through an IP telephony service provider. Each OOP controller in the series is programmed to provide various access and control levels to various users depending upon the level of access desired for

20 each individual OOP controller user. Controller access can include various control selections, such as selections for global service provider controls, local system administration controls, office administrator functions, and end-user control functions for individual communications management. By using configurable OOP controllers,

the facility's communications systems can be operated from any platform capable of operating on OOP, with each controller being configured based upon the status of the user making communications control selections.

FIG. 1 shows an example controller 110 for controlling a communications system 100 that is adapted to communicate data including IP telephony data, according to another example embodiment of the present invention. The controller 110 includes a computer communicatively coupled to an IP communications link 105. A control center 120 is coupled to the IP communications link 105 through a router 130. The control center stores and accesses configuration information for controlling the routing of data including IP telephony data to the controller 110 and an IP telephony device 140. The stored configuration information is accessible by the controller 110 for display. A user can view the displayed configuration information at the controller 110 and make changes to the configuration using a user interface at the controller 110.

The user interface provides the necessary modules permitting a user to implement control inputs for activating changes in the controller. These modules include, for example, input devices such as a keyboard, mouse, voice activation device, or touch screen, and the responsive functional software block for carrying out the implementation in response to the user input data. In addition, telephony controls for the IP telephony device 140 such as caller ID, speaker phone, answer, forward to voicemail, hold, and call termination are also accessible at the controller 110.

In one implementation, the control center 120 includes permission levels for receiving control selections from various users having different levels of access for making the selections. This is particularly useful because a global operating system,

such as a system based on OOP, can be used by several different users sharing the same or different controllers 110. For example, an end user of the IP telephony device 140 may have access levels allowing her to configure the IP telephony device 140 and the communications sent to her. Such access levels can be controlled using a password or

5 other security measure tailored for each particular use of the controller.

The user-selected configuration may include a variety of communications selections. For instance, individual telephony control configuration for an end-user may include one or more of the following example communication management options: speaker phone activation, call announce, call answer, call forward to voicemail, call

10 forward to another number or IP telephony address, call hold, call waiting, call termination, display of caller ID, speed dial, call transfer, redial, voicemail forwarding, voicemail messaging, multi-party calling call muting, video control, call tracking, call billing, and remote access control for enabling remote access to telephony services such as those described hereinabove. In addition, the user-selected configuration may

15 include a variety of other non-telephony communications selections, such as for email, electronic billing and ordering, personal address book applications, and general display characteristics for the communications information and controls to be displayed at the controller 110.

For private access to particular communications data, security measures may be

20 put in place for individual users to have exclusive access to configure the communication controls or retrieve personal information such as voicemail or email.

FIG. 2 shows an example graphic arrangement that can be displayed at the controller 110 in connection with some or all of the above-mentioned example embodiments, or

for other applications not specifically discussed herein. In one implementation, the graphic arrangement is tailored to each particular user. Each user can make selections for display, such as personalized speed dial functions, contact addresses and phone numbers, and display color and arrangements.

5 A system administrator can also access the configuration information using a password or other security measure that enables administration-level configuration options. The control center 120 recognizes the password and provides configuration information and control selections to the system administrator based on the permission level assigned to her. Typical system configuration selections may include, for

10 example, telephony device address assignment, user-access permissions, system report generation, display settings for the controller, voice mail parameters, IP telephony device hardware configuration, system backups, call routing protocol, call accounting, and call logging. FIG. 3 shows an example graphic arrangement that can be displayed at the controller 110 in connection with some or all of the above-mentioned example

15 embodiments, or for other applications not specifically discussed herein.

In addition to the end-user and system administrator examples provided herein, other users having various levels of permission can access and make selections from the configuration information based upon the permission level assigned to each user. For instance, an office administrator uses the controller 110 for routing incoming calls in a

20 facility. In another instance, a service provider such as a telephone company or an Internet service provider (ISP) uses the controller 110 for controlling system settings for a user facility.

FIG. 4 shows an IP telephony communications system 400, according to another example embodiment of the present invention. Some of the basic communications principals of the system in FIG. 4 are similar to those discussed hereinabove in connection with FIG. 2. The system includes a plurality of user interface devices, each 5 having OOP-based platforms, and IP telephony devices communicatively linked to an IP communications link 402. Any one of the communications devices 412, 413, 420, 425, 441, 442 and 443 can be used to control configuration or call control options for one or more of the telephony devices 414, 415, 416, 431 and 432. In one particular implementation, each of the communications devices is also adapted to function as an 10 IP telephony device.

The system includes a control center 405 having an OOP interface and communicatively coupled to the rest of the components in the system 400 via a router 408. As shown, the Internet is used to connect to various components of the system, and a user facility 410 having several components coupled to the communications link 15 402 via a router 411. FIG. 4 shows an example application of the versatility of the controller and control platform described herein.

In one example embodiment of the present invention, the control center 405, router 408, and OOP-based controller 420 are located at a service provider location 422 adapted to provide communications services including IP telephony services to various 20 users. Individual user 425 and user facility 410 are coupled to the service provider 422 via the IP communications link 402. Additional users are coupled to the service provider location 422 via the communications link and the Internet. Further users may also be communicatively coupled to the service provider via an IP/PSTN gateway 450.

The controller 420 is used to make configuration selections at the control center 405 for controlling communications for each of the users. The configuration selections can be tailored to particular users and subscription packages using the controller interface 420. For example, billing options, call routing options, and user access options can be controlled using the controller 420.

A variety of users benefits from the use of an OOP control center and OOP-based controllers. For example, a single end-user having a computer 425 with an OOP platform and an IP telephony device can be communicatively coupled to the service provider via the IP communications link 402. The service provider assigns a particular phone number or numbers to the IP address at the computer 425, and programs the control center to enable a particular user permission level for the single end-user. Using a display interface at the computer 425, such as shown in FIG. 2, the end-user can make configuration and call control selections for her communications. When an outside caller, such as a caller using the PSTN, calls the number assigned to the user 424, the computer 425 alerts the user of the incoming call. The alert may, for example, include a traditional telephone ring, or an enhanced alert such as a call announce indicator displayed on a computer screen. The user can make call control selections from the call announce indicator, such as those described hereinabove. The user can also retrieve information about the caller, such as via caller ID or other information about the caller either stored at the computer 425, at the control center 405, or accompanying the caller ID.

The OOP interface enhances a user's ability to be mobile while maintaining communications services. For instance, the end user may use a portable computer as a

controller, and use an interface such as shown in FIG. 2 for making configuration and call control selections. One example configuration selection includes selecting a particular IP address to which to route calls, such as when the user is traveling. The user can make configuration changes at the control center prior to leaving a home

5 office, or connect through the Internet once arriving at a remote location. After the changes are made using the controller interface, the control center routes incoming telephone calls to the new IP address. This is particularly useful in today's mobile society as users often work from several office locations, from home, on vacation, or when traveling. In addition, because the OOP-based controller is adapted to access

10 various communications information, email, voicemail, and contact information can be accessed from any computer having an OOP-based platform. Furthermore, telephone calls can also be received if the computer is further equipped with IP telephony capability. In this manner, the communications controller enables a user to re-route her telephone calls to virtually any IP address at a remote computer that supports OOP and

15 IP telephony.

Another application for mobile users involves the use of a wireless telephone or wireless computer having IP telephony capabilities. For example, a user at the controller 425 can use the controller interface to configure the control center 405 to route calls to a wireless IP address. Incoming calls are routed directly to the wireless

20 telephony device.

When the end-user is part of a user facility 410, the controller can be enabled with further functions for various users in the facility. For example, a system administrator having a computer interface 412 including an OOP-based platform can

control the options for various IP telephone users in the facility using an interface such as shown in FIG. 3. This user-friendly interface enables the system administrator to control communications within the facility by providing particular programming and configuration permission levels for various users and by routing calls to IP addresses

5 assigned to a particular number. One advantage of using the OOP-based controller is the ease of assignment of telephone numbers to particular IP addresses. For instance, when someone moves offices or locations, there is no need to run additional wiring or otherwise reconfigure existing wiring. The system administrator can access the control interface and edit the IP address for the particular number and effect the change.

10 The user facility 410 may also include a controller, such as controller 413, for use by an office assistant for monitoring and controlling incoming calls. The office assistant can answer calls for individuals within the facility using a control interface with the controller 413, such as shown in FIG. 2. For example, the assistant can control the call by pointing and clicking with a mouse or using another interface device such as 15 voice recognition hardware. This enables the assistant to place the call on hold, to send the call to a particular location in or out of the facility, to send the call to voicemail, or to perform other typical call routing functions in a user-friendly manner. This is useful, for example, for forwarding calls to a user who is not at her normal workstation without having to dial the forwarding number.

20 Referring again to FIG. 4, and according to another example embodiment of the present invention, various other users are communicatively coupled to the control center 405 via the Internet. Such users may include individual users such as described in connection with controller 425, or may include a user facility such as facility 410. IP

telephones 431 and 432 can be directly connected to the Internet for individual use, or may be used in conjunction with each other and/or with one or more of the computers 441, 442 and 443. Any of these devices may also be used with the user facility 410 or the individual user 425. The portability of the OOP-based controller interface enables 5 such flexible use, and expands the current scope of telephony and other communications.

Other example embodiments of the present invention include one or more aspects of the other patent documents mentioned herein.

While the present invention has been described with reference to several 10 particular example embodiments, those skilled in the art will recognize that many changes may be made thereto without departing from the spirit and scope of the present invention, which is set forth in the following claims.

What is claimed is:

1 1. A user-programmable communications arrangement including a computer
2 having a display, the arrangement comprising: a user interface; and a programmable
3 controller, the user interface and the programmable controller being adapted to:
4 provide user-selected IP telephony configuration information to a control center
5 communicatively coupled to a plurality of IP telephony devices;
6 display a control interface for at least one of: user control of an IP telephony
7 device, office telephone administration control of a plurality of telephony devices, and
8 system administrator control of telephony system configuration; and
9 the IP telephony configuration information being selected to control
10 communications between, and to programmably configure, the control center and the
11 plurality of IP telephony devices.

1 2. The user-programmable communications arrangement of claim 1, wherein the
2 computer is adapted to announce an incoming call via the display, the call announce
3 being effected without overtaking currently-running applications.

1 3. The user-programmable communications arrangement of claim 2, wherein the
2 call announce is effected using a locally-installed OOP applet that runs in the
3 background of the computer.

1 4. The user-programmable communications arrangement of claim 2, wherein the
2 call announce displays user control options including at least one of: caller ID, speaker
3 phone, answer, forward to voicemail, hold, and call termination.

1 5. The user-programmable communications arrangement of claim 1, wherein the
2 user interface includes a graphic user interface (GUI).

1 6. The user-programmable communications arrangement of claim 1, wherein the
2 computer includes one of the plurality of IP telephony devices.

1 7. The user-programmable communications arrangement of claim 1, wherein the
2 controller is adapted to access personal contact information.

1 8. The user-programmable communications arrangement of claim 7, wherein the
2 personal contact information is arranged in a searchable database accessible by the
3 controller, the database being accessible via user-defined shuffle-search statements.

1 9. The user-programmable communications arrangement of claim 1, wherein the
2 controller is adapted to provide a control interface for system administration control of
3 an IP telephony network, the interface being adapted to provide at least one of: IP
4 telephony system configuration and system status information.

1 10. The user-programmable communications arrangement of claim 9, wherein the IP
2 telephony system status information includes at least one of: IP address assignment
3 information for telephony devices, user-access security control level settings, current
4 telephony device hardware settings, display settings for the controller, and telephony
5 device location information.

1 11. The user-programmable communications arrangement of claim 9, wherein the
2 control interface is adapted to configure the IP telephony system to control at least one
3 of: telephony device address assignment, user-access permissions, system report
4 generation, display settings for the controller, voice mail parameters, IP telephony
5 device hardware configuration, system backups, call routing protocol, call accounting,
6 email configuration settings and call logging.

1 12. The user-programmable communications arrangement of claim 1, wherein the
2 computer is adapted to use OOP for providing the user-selected IP telephony
3 configuration information to the control center.

1 13. The user-programmable communications arrangement of claim 1, wherein user
2 control of an IP telephony device includes active call control and call receive settings
3 including at least one of: speaker phone activation, call answer, call forward to
4 voicemail, call forward to another number or IP telephony address, call hold, call
5 termination, display of caller ID, speed dial, call transfer, redial, voicemail forwarding,

6 voicemail messaging, multi-party calling call muting, video control, and remote access
7 control for remote access to telephony services.

1 14. The user-programmable communications arrangement of claim 1, wherein each
2 of the plurality of IP telephony devices includes a CPU, and wherein the user interface
3 and controller are further adapted to:

4 provide user-selected email configuration information to a control center
5 communicatively coupled to each CPU;

6 display a control interface for at least one of: user control of email
7 configuration, office administration control of the plurality of CPUs, and system
8 administrator control of email system configuration; and

9 the email configuration information being selected to control communications
10 between, and to programmably configure, the control center and the plurality of CPUs.

1 15. A user-programmable communications arrangement comprising:
2 a user-interface device having a display, the device being adapted to provide IP
3 telephony communications configuration information to a user via the display and to
4 communicate IP telephony communications configuration selections from the user to a
5 CPU; and

6 a programmable CPU communicatively coupled to the user interface device and
7 having an OOP interface coupled to an IP telephony communications link, the
8 microprocessor being adapted to receive the IP telephony communications
9 configuration selections from the user-interface device and, in response to the received

10 selections, control selected functions of selected IP telephony devices of an IP
11 telephony communications system via the IP telephony communications link.

1 16. The user-programmable communications controller of claim 15, wherein the
2 CPU is adapted to control the scope of IP telephony communications configuration
3 selections that can be made by a particular user.

1 17. The user-programmable communications controller of claim 15, wherein the IP
2 telephony system includes a memory storage device having user-access configuration
3 data, wherein the CPU receives the configuration data for controlling the scope of
4 configuration selections that can be made by a particular user.

1 18. The user-programmable communications controller of claim 17, wherein the
2 memory storage device is adapted to send display information to the user-interface
3 device using OOP, the display information including available IP telephony
4 communications selections.

1 19. The user-programmable communications controller of claim 15, wherein the
2 user-interface device communicates the configuration selections using OOP.

1 20. A user-programmable communications control system for controlling a
2 communications network using OOP code, the control system comprising:

3 a plurality of telephony devices coupled to an IP communications link and
4 adapted to communicate IP telephony data; .

5 a computer station having an OOP interface, the station being adapted to display
6 communications information including telephony communications information and to
7 provide communications control selections including telephony control selections to the
8 IP communications link; and

9 a programmable communications server having an IP telephony switch and an
10 OOP interface coupled to the IP communications link and adapted to receive the
11 communications control selections, the programmable communications server being
12 adapted to control the communications network, including the plurality of telephony
13 devices, responsive to the selections received through the OOP interface.

1 21. The user-programmable communications control system of claim 20, wherein
2 the scope of communications control selections that can be made at the computer station
3 is controlled by the programmable communications server based on a predefined user-
4 access permission level.

1 22. The user-programmable communications control system of claim 20, further
2 comprising a plurality of the computer stations, wherein programmable communications
3 server is adapted to receive communications control selections from each of the
4 plurality of computer stations.

Abstract

The present invention is directed to IP telephony communications control. A user-interface device is communicatively coupled to an IP communications link and adapted to provide communications control selections to a user via a display. A 5 plurality of IP telephony devices are coupled to the IP communications link. Selections from the display are used for providing communications control including control of communications for at least one of the plurality of IP telephony devices. The user-interface device is adaptable for use by various types of users, such as system administrators, office administrators, and individual telephony device users. In this 10 manner, efficient and flexible user control of IP telephony applications is effected using a portable operations platform that is adaptable for use by different users at various locations.

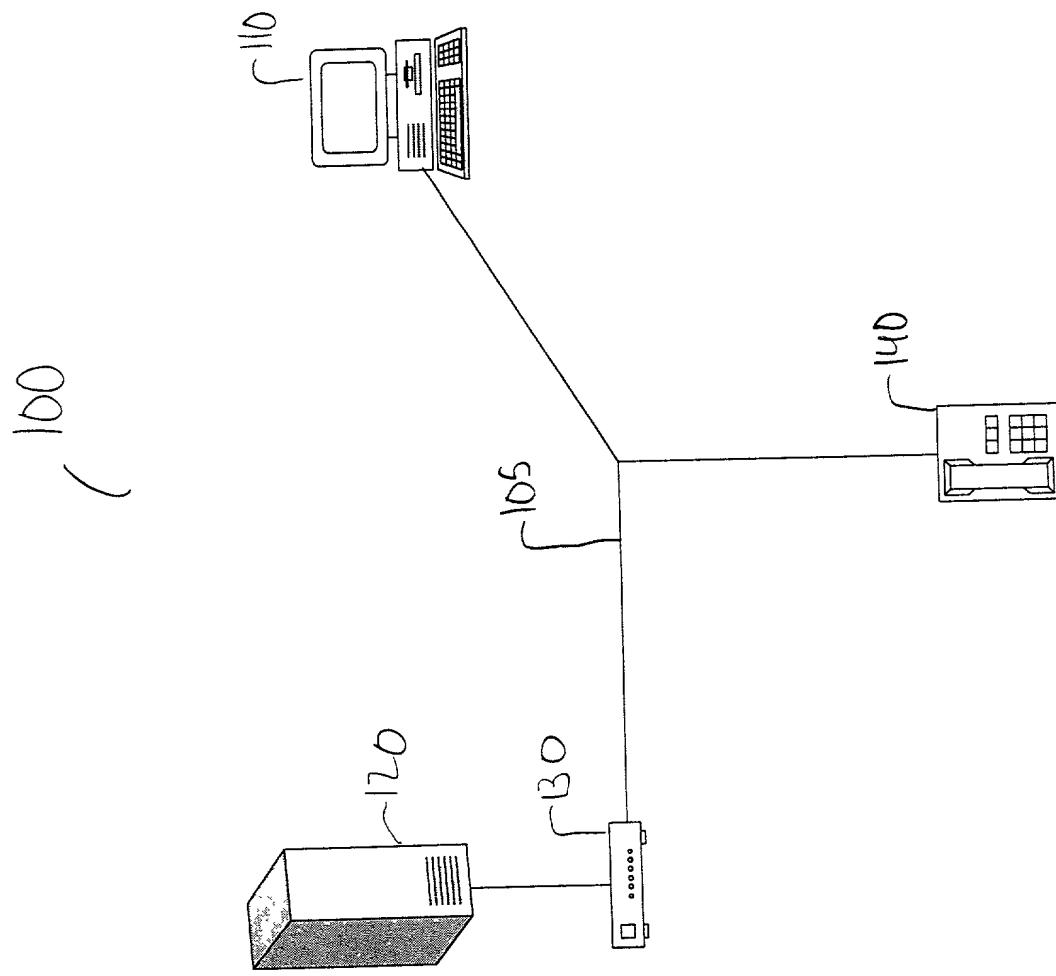
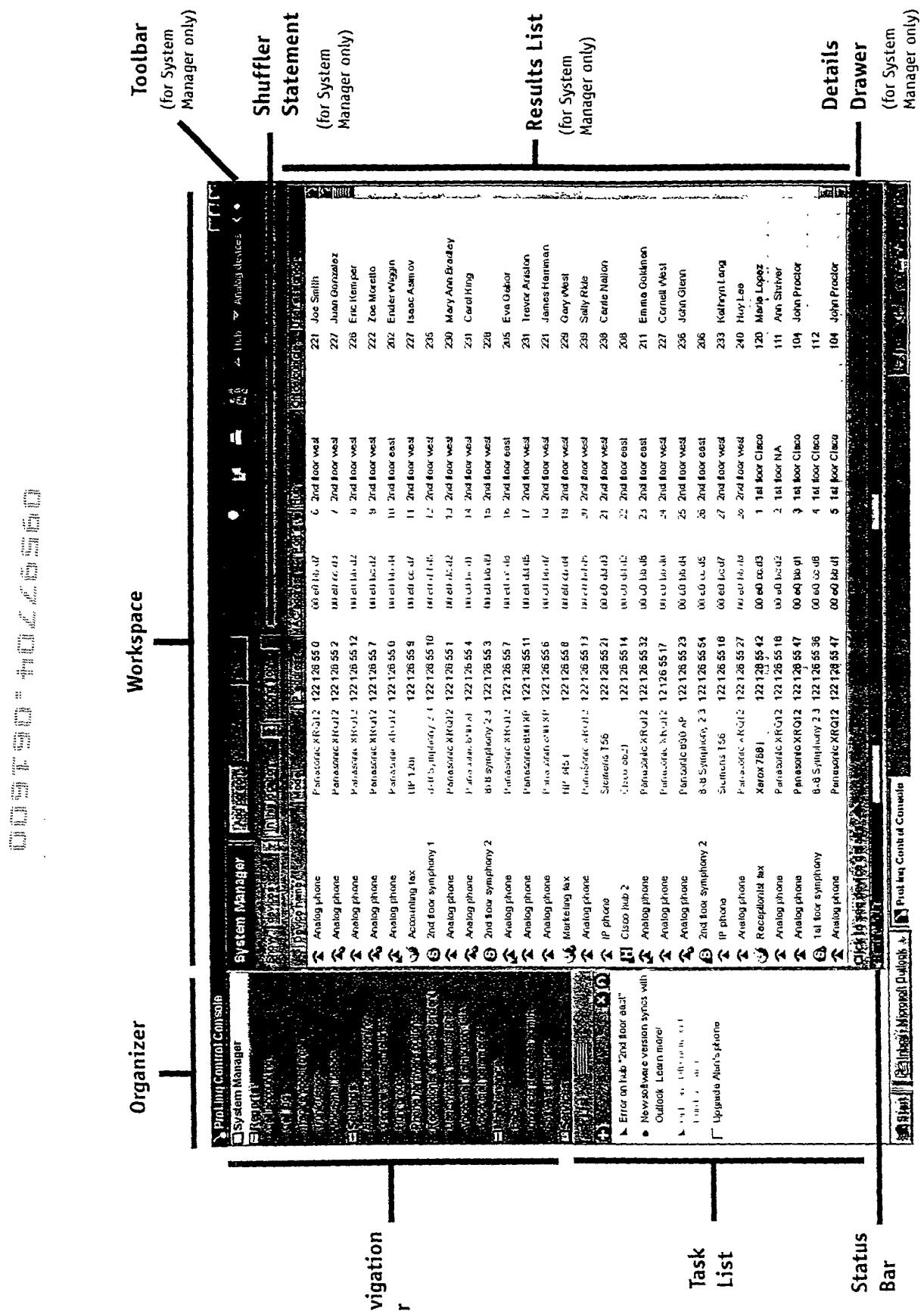


FIG. 1

2
Fig.



3
Eij

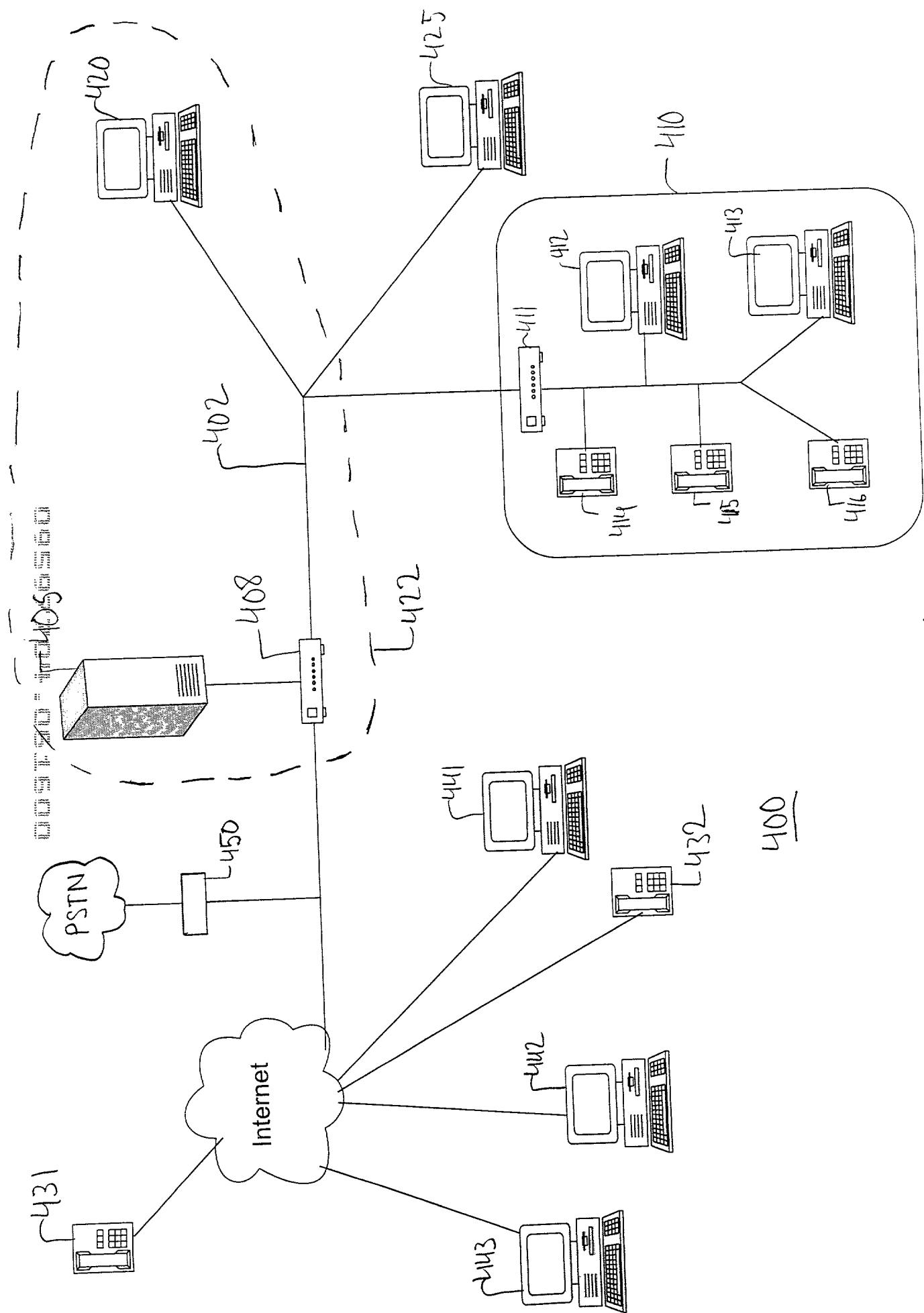
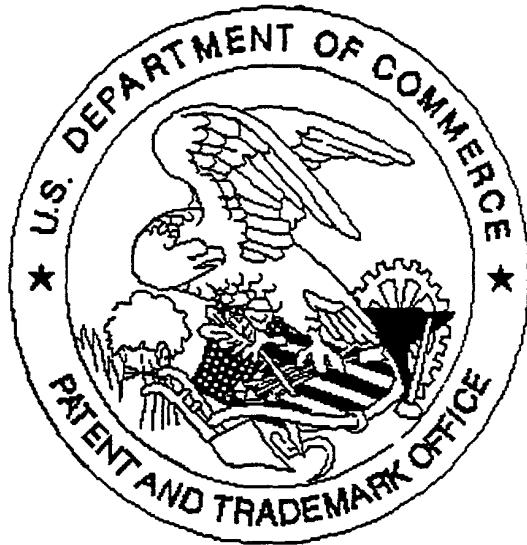


FIG. 4

United States Patent & Trademark Office
Office of Initial Patent Examination -- Scanning Division



Application deficiencies were found during scanning:

Page(s) _____ of NO Transmitter! were not present
for scanning. (Document title)

Page(s) _____ of _____ were not present
for scanning. (Document title)

Scanned copy is best available.